



“Spectrum Management Issues for Caribbean - IoT Deployment”

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INTERNET OF THINGS (IOT)

- ITU–T Y.2060 defines the Internet of Things (IoT) as a *global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.*
- Applications:
 - Public safety
 - Industrial, Retail, Agriculture, Fishing
 - Smart; Offices, Homes, Appliances and Cities.
 - E-Health applications, Intelligent transport systems, etc.
- Connectivity options:
 - **Wired devices:** Ethernet
 - **Wireless:** Unlicensed and Licensed Frequency Bands
 - **Protocol / Technology:** Bluetooth, Zigbee, Z-Wave, Wi-Fi, Cellular, etc



INDUSTRIAL, SCIENTIFIC, AND MEDICAL (ISM) BANDS IN ECTEL'S REGIONAL FREQUENCY ALLOCATION TABLE

Frequency Range		Bandwidth	Applications
13.553 MHz	13.567 MHz	14 KHz	
26.957 MHz	27.283 MHz	326 KHz	
40.660 MHz	40.700 MHz	40 KHz	
902.000 MHz	928.000 MHz	26 MHz	Wireless Sensor Networks (WSN) Wireless LANs / Home Networks Cordless Phones
2.40GHz	2.500 GHz	100 MHz	Wireless Sensor Networks (WSN) Wireless LANs / Home Networks Cordless Phones WiFi (802.11)
5.775 GHz	5.830 GHz	55 MHz	Cordless Phones WiFi (802.11)
24.000 GHz	24.250 GHz	250 MHz	

ADVANTAGES / DISADVANTAGES OF UNLICENSED BANDS

○ Advantages:

- The lack of licensing requirements has greatly encouraged the growth of the wireless devices in this band.
- Free..

○ Disadvantages:

- Many of these bands are highly utilized.
- Lower power limits <1 W
- Limited range
- Greater chance of receiving interference.



FREQUENCY BANDS OPTIMAL FOR THE INTERNET OF THINGS

LICENSED BANDS

- **Licensed bands:** cellular networks bands, granted to network operators for deploying specific cellular technologies 2G / 3G / 4G / 5G.
- There are 14 frequency bands defined for GSM (3GPP TS 45.005), 26 for WCDMA (3GPP TS 25.101), and 44 for LTE (3GPP TS36.101)
- TV whitespaces: applications could be deployed in the gaps between transmission of digital terrestrial TV services below 1GHz.
- Satellite spectrum Bands: L (1- 2 GHz) / S (2 – 4GHz) / C (4-8 GHz) / X (8-12 GHz) / Ku (12 – 18 GHz) / Ka (26 – 40 GHz)
- **Exceptions:** Frequency bands allocated to the following radio services: aeronautical, maritime, military, etc.



ADVANTAGES / DISADVANTAGES OF LICENSED BANDS

○ Advantages:

- Protection against Interference
- Coexistence of many simultaneously connected devices
- High reliability
- Higher operating power - Long range
- Capable to service both low-data rate latency-sensitive and high-data rate applications on the same infrastructure.

○ Disadvantages:

- High power consumption of resource-constrained devices,
- Scarce resource
- Expensive frequency bands.
- Difficult to acquire



SPECTRUM MANAGEMENT / DEPLOYMENT ISSUES

- Spectrum Management Agencies will need to have an idea of the additional spectrum to support the expanding IoT infrastructure.
- Uncertainty / unavailability of spectrum is known to have discouraged investment.
- Priority should be given to existing licence-exempt bands and to bands enabling economies of scale and global harmonization.
- There is a need for greater harmonization of licensed band choices.



SPECTRUM MANAGEMENT / DEPLOYMENT ISSUES

- Steps must be taken to prevent interference between frequency bands.
- Use recognized certification body for type approval of devices.
- Interoperability – the ability of devices from different vendors to exchange data.
- Implementation of fewer bands to lower device cost, which in turn lowers the bar for mass-market acceptance.



QUESTIONS

